UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

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EROSION CONTROL PRACTICES DIVISION

Kentucky Fescue for Winter Grazing - B. H. Hendrickson, Watkinsville, Georgia.-"Established Kentucky fescue grass pastures have produced almost identically the same amount of winter grazing during the present severely cold winter, as they did during the mild previous winter. Only one other grass, namely rescue grass, did nearly as well. All of the strictly winter annual forage grasses and legumes were severely set back by freezes, and produced little grazing until late February.

"Grazing rates are never constant, month to month, over winter. Approximately 2 to 2-1/2 acres of fescue per cow unit are needed on the full-feed basis, for beef cattle in the winter, according to Station records.

"Very close winter grazing of fescue does not appear to have damaged the stand. Rescue, a very palatable short-lived perennial, is likely to recover slowly after a period of too-close grazing, because much of the stand consists of seedling plants. Orchard grass does not make much growth during the winters, although it recovers quickly at the advent of warm early spring weather.

"The tall fescues - Kentucky fescue particularly - is certain to become more popular in the Southeast as a result of its winter hardiness, and its ability to make good fall growth and retain most of its foliage in a green condition over winter despite severe freezes. It is unique in that it can be used for a period of years as a dependable winter grazing perennial grass, a high-acre-value conservation cash seed crop, and for hay or summer grazing, - all in the same rotation pasture.

"Rescue grass, sown in late fall on several fields has shown remarkable ability to survive severe freezes. The indications are that it will prove to be another very useful cool-weather grass in this area."

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** All research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

Severe Freezes Vs. Growing Weather in Winter - B. H. Hendrickson, Watkinsville, Ga.-"Following an unusually severe 4° F freeze on November 25, 1950, which caused widespread damage to winter cover crops and winter grazing prospects in the Southern Piedmont, a study made of frequencies of minimum winter temperatures over the 66-year period of Weather Bureau record indicated that we may expect freezes of 10° F and below, one year in 3, on the average, in the vicinity of Athens, Ga.

"Our experience indicates that temperatures below 10° F will likely kill most young seedlings, damage older seedlings, and temporarily, at least, kill back to some extent a portion of the top growth or foliage of hardiest established stands of perennials. As far as establishing fall-sown cover crops is concerned, the indications are that the best chance of success, year-in and year-out, will require as early fall planting as is practical, as seedlings of our cool weather growers are better able to withstand severe freezes after they have made substantial growth. They continue to make additional growth, intermittently, even during the two coldest December and January mid-winter months, when we have growing temperatures above 50° F at least 1/4 of the time, and from 1/3 to nearly 1/2 of the time for November, February and March, according to 7-year averages of Station record."

Cheap and Efficient Production - B. H. Hendrickson, Watkinsville, Ga.-"We think first of cash crops, but let's take beef. Suppose you had spent $40. per acre and upwards preparing a well limed, fertilized and seeded new fall pasture planting for winter grazing on average open cropland, and when the excellent stand of young seedlings were one or two inches out of the ground, a sudden severe freeze killed them out. A lot of Georgia livestock men are in that fix, right now. Chances of securing green winter grazing are practically gone, for this winter. Hay prices have sky-rocketed.

"We can't prevent freezing weather. But we can do something about it, in terms of insuring much better success with establishment of fall sown cover crops, the conservation way. It does take some planning, and it takes some time to condition our considerably eroded, depleted upland soils, to fit them for these planting, especially of legumes.

"We have found that 2 prior years' growth of lespedeza builds up the soil's content of organic matter considerably, especially when its full residues remain on the land. Planted in early spring in small grain, with moderate rates of fertilization, lespedeza succeeds well on average Piedmont old croplands, and volunteers well for its second year of growth.

"This is our stand-out conservation agronomic practice for cultivated land and the basic method for crop rotations. Still better soil conditioning is obtained on steeper, rougher more eroded slopes when the thin soil has been improved by several years' growth of sericea or of kudzu and their residues. These upland areas are the ones likely to be used for permanent pasture on most farms. And here protection against erosion and soil build-up are most needed.

"Use of residues, mulches, prior legume build-up, - then early plantings on well fertilized seedbeds, in a few words, - is what we mean by the 'conservation way.' Every time we provided these prior conditions, without exception, in Station tests we have secured outstanding results with our fall-sown cover crops. Some of them are more cold-resistant than others, but on the whole, there is good insurance in the use of conservation methods, and from the standpoint of cheap and efficient production of beef there is a decided economic advantage as well."

Winter Runoff in Relation to Crop Residues on Land Surface - George N. Sparrow, Tifton, Ga.-"Beginning just before midnight on February 6 and continuing into the early morning hours of February 7, a rain of 1.67 inches fell, with 0.9 inch of rainfall occurring in one hour. Unfortunately, the multislot divisors were not yet in place between tanks, which limited the measurable quantity of water loss to the 60 cubic foot capacity of one tank at each plot. At that time quantity measurements were possible on only one series of tanks, which permitted no duplication of data for checking. Consequently, the data obtained have no experimental significance, but they do furnish the following interesting contrasts:

Plot No.	Crop or Land Cover	Water Loss (cu. ft.)
1	Oat stubble and crotalaria	14
2	Bare (Peanut land)	More than 60
3	Practically bare (Blue lupine land)	More than 60
4	Practically bare (Blue lupine land)	More than 60
5	Cut corn stalks lying on surface	14
6	Young oats (poor stand)	More than 60
7	Young oats (poor stand)	More than 60
8	Partial sod, Coastal Bermuda grass	More than 60
9	Practically bare (Blue lupine land)	More than 60

"All plots are on Tifton sandy loam on 3% slope. Soil was relatively dry prior to rain. Blue lupine stands were practically nil, due to the effects of freezing temperatures. Cold weather had also hurt the stand and stunted the growth of the oats."

Weight of Underground Parts of Grasses - C. J. Whitfield, Amarillo, Texas.-"Sod samples were taken in August 1950 from some grass plots to a depth of 12 inches, for the purpose of studying the amount of underground plant material under each of five kinds of grasses. The plots were in three replications and five sites were sampled per plot. The amount of oven-dry material washed from each 3-inch layer of soil was computed on a tons-per-acre basis and gave some surprizingly high values ranging from 8.6 to 29.0 tons per acre 12-inches.

Grass	Mean Weight of Underground Parts - Tons per acre					Ratio Wt. 0-3" Wt. 9-12"
	0-3"	3-6"	6-9"	9-12"	0-12"	
Blue grama	11.51	1.53	.77	.62	14.43	18.3
Western wheat	5.54	1.56	.81	.72	8.63	7.7
Sideoats grama	8.47	1.37	.54	.28	10.66	30.2
Buffalo grass	3.88	1.30	.87	.43	6.48	9.0
Crested wheat	26.65	1.67	.41	.25	28.98	106.6

"The values obtained for the sod-forming grasses are close to the actual amount of underground parts beneath an acre of a good stand of the grasses. With crested wheat, which has a bunch-type of growth, the values would be too high since the samples were taken in the vicinity of the bunches. The ratio of the amount of material in the 0-3 inch layer to that in the 9-12 inch layer shows distinct differences in the gradient of roots with depth. Crested wheat had the most roots in the 0-3 inch zone but the least in the 9-12 inch zone. Western wheat showed the most uniform distribution of roots."

Effect of Cultivation Versus no Cultivation on Runoff and Crop Yields - O. R. Neal, New Brunswick, N. J.-"In 1948 an exploratory study was begun on the effect of cultivation versus chemical weed control with no cultivation on runoff and crop yields. Two small plots 7 feet wide by 35 feet long were established and equipped to measure runoff. Field corn was grown on both plots and treatment was identical with the exception of cultivation. Rows were planted up and down the slope. Tensiometers were installed to study soil moisture conditions. One plot was cultivated only enough to control weeds and a chemical weed killer was used on the other one. The chemical weed killer proved ineffective in controlling grasses so flame weeding was used to obtain complete weed control.

"This study has been carried on for the past 2 years using flame weeding on one area and minimum cultivation on the other. Records of moisture tension and soil and water losses have been taken during the growing season and crop yields measured. The 1950 results on runoff and yield are shown below.

Soil & Water Losses & Corn yields from Cultivated & Uncultivated Field Corn Areas

Treatment	Soil loss Lbs./Acre	Runoff Inches	Corn Bu./Acre	Stalks Tons/Acre
Cultivated	3510	3.10	91	8.09
Uncultivated	2820	3.26	73	5.18

"The total soil losses have been consistently higher from the cultivated area for all three years. Total runoff has been slightly less from the cultivated area for two of the three years. In 1949 the runoff from the cultivated area was slightly higher than from the uncultivated area. However, 1949 was relatively dry with less rain during the growing season. Corn yields have been from 15% to 30% higher from the cultivated area.

"There was a tendency for both soil and water losses to be higher from the uncultivated area during the early part of the season while the corn was cultivated. This tendency was reversed after cultivation ceased. This seems to indicate some structural deterioration of the soil due to repeated cultivations during the early part of the growing season. Soil moisture tension was somewhat higher on the uncultivated area during the early part of the season. During the later part of the season after cultivation ceased moisture conditions were not significantly different between the two practices.

"The above yield data are not in agreement with results from the old time studies which indicated that weed control was the only benefit from cultivation. A possible explanation lies in the fact that the earlier studies were made on soils that were high in organic matter, had been cultivated for a much shorter time, and presumable had not suffered serious deterioration of

structure. Such soils would provide sufficient aeration for good crop growth without being loosened by cultivation. Soils in the present study have deteriorated in structure to the point where even the temporary increases in porosity and aeration induced by cultivation are of benefit to crop growth. This again emphasized the need for management practices which improve structural conditions in these soils."

The Effects of Legumes and Nitrogen Fertilizer in a Soil Conservation Program - F. L. Duley, Lincoln, Nebraska.-"The effects of legumes and nitrogen fertilizers in a soil conservation program were well illustrated by some of our results on corn, which have been summarized recently. These are shown in the following table in which the mean yields of plowed and subtilled land are used. This was done because the differences were small and it simplifies the table to bring out the legume and nitrogen effects.

"It will be seen that in the grain rotation without legumes or fertilizer the yield was 61.9 bushels. When 40 lbs. nitrogen as ammonium nitrate was added the yield was 88.6 bushels, or an increase for nitrogen of 26.7 bushels. If the legume was also added as in the brome-alfalfa the yield was 105.8 bushels, or 17.2 bushels more than where the nitrate alone was added.

Effect of Sweet Clover and Nitrogen fertilizers on yields of corn[1]

Rotation	Yield Corn - Bushels per acre		
	Without Nitrogen	With Nitrogen	Increase for Nitrogen
Oats, wheat, corn	61.9	88.6	26.7
Corn after brome and alfalfa, 3 years	97.1	105.8	8.7
Corn after 1 year sweet clover	106.5	-	-
Increase brome and alfalfa, 3 years	35.2	17.2	
Increase for sweet clover, 1 year	44.6		

1 Yields given are mean of subtillage and plowed plots.

"If the fertilizer was added to the brome-alfalfa land the yield was increased by only 8.7 bushels. This amount could be credited to the nitrogen. Where corn followed one year sweet clover the yield was 106.5 bushels or 44.6 bushels more than the corn in the unfertilized grain rotation.

"These results confirm the value of the widespread use of brome and alfalfa in a soil conservation program. This is true where the grass and legume are needed for pasture. If the pasture is not needed it should be noted that the effect of one year of sweet clover which was seeded with oats was as great as the brome alfalfa. The year of sweet clover is also excellent protection against erosion. If subtilled before corn the sweet clover residue continued to protect the land while the grain crop is growing.

"Therefore, whether we should use brome and alfalfa or simply a legume like sweet clover in a soil conservation program will depend on whether we can use the grass-legume mixture to advantage for pasture."

Permeability of Some Soils in the Palouse Area - G. M. Horner, Pullman, Washington.-"Permeability measurements of soils on the Station show a wide variation as influenced by soil type, which is correlated with slope exposure. The data given below represents the permeability characteristics of the area in the Palouse where heavy subsoils occur. The north slope Thatuna soils and the upper south slope Palouse soils have very slowly permeable subsoils, while the hilltop and the lower south slope soils have more permeable subsoils.

Sample description	Volume weight	Pores drained (60 cm. tension)	Percolation Rate	
			Field Core	Saturated Core
		%	in./hr.	in./hr.
Location: South slope, 300 feet from hilltop, Palouse silt loam				
"A" horizon, 4"-7"	1.21	9.9	2.75	1.49
"A" horizon, 8"-11"	1.21	6.7	2.81	1.09
"A" horizon, 15"-18"	1.26	9.0	10.36	7.87
Transition, 26"-29"	1.35	6.9	6.57	3.11
"B" horizon, 36"-39"	1.42	5.3	2.47	3.32
"B" horizon, 48"-51"	1.54	4.3	0.96	0.28
Location: South slope, 150 feet from hilltop, Palouse silt loam				
"A" horizon, 4"-7"	1.34	5.1	3.44	1.51
"A" horizon, 7"-10"	1.33	9.0	2.30	0.34
Transition, 11"-14"	1.36	4.2	0.77	0.32
"B" horizon, 19"-22"	1.50	2.3	0.04	0.02
"B" horizon, 27"-30"	1.57	-	0.00	0.00
"B" horizon, 44"-47"	1.67	-	0.00	0.00
Location: Hilltop, Athena silt loam				
"A" & "B" horizons mixed 4"-7"	1.32	6.1	1.85	0.57
"B" horizon, 8"-11"	1.43	5.4	1.13	0.34
"B" horizon 11"-14"	1.42	6.3	1.17	0.99
"B" horizon, lime 20"-23"	1.29	5.9	0.73	0.58
"B" horizon, lime 26"-29"	1.30	6.1	0.98	0.75
"B" horizon, lime 36"-39"	1.29	5.7	0.83	0.78
Location: Steep north slope, Thatuna silt loam				
"A" horizon, 4"-7"	1.15	5.5	1.01	1.16
"A" horizon, 12"-15"	1.12	5.0	0.90	1.29
"A" horizon, 20"-23"	1.11	7.8	3.14	4.43
Transition, 30"-33"	1.28	7.3	0.57	1.09
Grey layer (A_2) 48"-51"	1.56	3.5	0.04	0.04
B_2 horizon, 53"-56"	1.68	-	0.00	0.00

Mulch Farming Corn Following Winter Cover Crop and Using Chemicals for Weed and Grass Control - O. W. Beale, Clemson, S. C.-"The study of the uses of herbicides to control weeds and grasses while growing corn under mulch conditions has produced some favorable results. The land was prepared for planting by disk harrowing and ripping with a spring tooth tiller to kill the cover crop and loosen the soil to a depth of 4 - 5 inches. The corn was planted and 700 lbs. of 4-10-6 fertilizer was applied with a conventional two row tractor planter and fertilizer distributor.

"The herbicides were to have been applied before the corn germinated, but rain delayed this operation and the corn germinated to a good stand. Grasses had likewise germinated. The original plan of pre-emergence applications of chemicals was discarded and a post emergence application was made.

"Previous tests indicate that grasses and weeds can be controlled by applications of 2,4-D before they become established, but that this chemical is less effective in controlling them after they are established. The corn was at a stage of growth when it is presumed to be most sensitive to 2,4-D. The yields of corn and the degrees of weed control are given in the following table. The degree of weed control and yield of corn were highest from the cultivated, no chemical plots and this yield is significantly higher than the yields from all other treatments. However, treatment 6 results indicate the possibility of better weed control and higher yields for any type of application of this chemical with negligible effect on the corn. The effect of the degree of weed control is significantly reflected in the low yields of treatments 3, 4 and 5 and to a lesser extent of treatment 6. Treatment 1 which received no chemicals and no cultivation produced the smallest yield of corn of all treatments.

Corn yields from treated & untreated mulched plots and degree of weed control

Treatment	Weed Control	Yields of corn bu./a.
1. No cultivation, no chemicals	none	16.2
2. Cultivated, no chemicals	excellent	49.3
3. 1 lb./a. 2,4-D, no cultivation	fair	35.8
4. 2 lbs./a. 2,4-D, no cultivation	good	32.9
5. 2 lbs./a. C & C EH No. 1, no cultivation	fair	31.8
6. 4 lbs./a. C & C EH No. 1, no cultivation	good	39.2

"Grasses probably cause the greatest reduction in yield when they are about the same age as the corn plants. If the growth of grasses can be retarded for a period of time until the corn is about 18-24 inches high or higher, usually about 4 to 6 weeks, the effects of weeds growing after that time will have no significant effects on yields except under severe drought conditions. It is possible to maintain a considerably greater amount of mulch on the soil surface when no cultivations for weed control are necessary and the benefits derived from mulch farming are enhanced."

Mulch Tillage Studies - T. W. Edminster, Blacksburg, Va.-"The 1950 basic tillage and fertilizer placement experiment consisted of a randomized split block design with five replicates. The results of this study are as follows:

"The double-cut plow was used again as the basic mulch tillage tool. All results to date indicate that complete inversion of the top 3-inch sod layer with simultaneous subsurface tillage to a total depth of 7 inches constitutes an effective practice under Virginia conditions. However, information is still lacking on the best possible methods for preparing the seedbed following the basic tillage operation. This problem along with fertilizer placement requirements received special emphasis in 1950. The two planting treatments consisted of an unmodified standard tractor-mounted planter with fertilizer attached as P1 and the same planter modified by the addition of disc hillers and double disc openers as planting treatment P_2. This treatment was selected following its use in the planting experiment because of its superiority in the physical manipulation of the mulched areas.

"The following table gives a summary of the results of the various tillage, fertilizer and planting treatments separately and their interaction with each other. All of the yield data have been analyzed by the analysis of variance but none of the differences are significant at the .05 level. The differences in yield as a result of fertilizer treatments F-1 and F-2 approach the significant level. The indicated superiority of the F-2 fertilizer treatment was even more pronounced when used with the P-2 planting treatment.

Mulch Tillage - Development Studies - 1950 Kipps Farm

No. Samples	Treatments*	Yield (Bu./Ac)	Stand (Stalks/Ac)	No Ears per acre	Ear Size Factor
60	T1	79.9	13,390	14,371	.00556
60	T2	79.2	13,517	14,611	.00542
60	T3	78.1	13,016	14,018	.00557
60	T4	79.7	13,291	14,181	.00562
120	F1	76.2	13,118	14,188	.00537
120	F2	82.3	13,489	14,403	.00571
120	P1	78.0	12,966	14,128	.00552
120	P2	80.5	13,641	14,463	.00557
15	F1 x P1 x T1	72.8	12,373	13,531	.00538
15	F2 x P1 x T1	79.4	13,107	14,096	.00563
15	F1 x P2 x T1	81.4	13,701	14,831	.00549
15	F2 x P2 x T1	85.8	14,379	15,028	.00571
15	F1 x P1 x T2	82.8	12,853	14,548	.00569
15	F2 x P1 x T2	74.7	13,023	14,153	.00528
15	F1 x P2 x T2	72.3	13,390	14,266	.00507
15	F2 x P2 x T2	87.1	14,802	15,480	.00563

(Continued)

Mulch Tillage - Development Studies - 1950 Kipps Farm (Continued)

15	F1 x P1 x T3	73.9	13,079	14,463	.00511
15	F2 x P1 x T3	85.1	13,079	14,209	.00599
15	F1 x P2 x T3	76.9	13,559	14,407	.00534
15	F2 x P2 x T3	76.5	12,302	12,994	.00589
15	F1 x P1 x T4	76.9	13,757	14,237	.00540
15	F2 x P1 x T4	78.2	12,458	13,785	.00567
15	F1 x P2 x T4	72.3	12,232	13,164	.00549
15	F2 x P2 x T4	91.5	14,718	15,537	.00589
60	P1 x F1	76.6	13,016	14,209	.00539
60	P1 x F2	79.4	12,917	14,047	.00565
60	P2 x F1	75.7	13,220	14,167	.00534
60	P2 x F2	85.2	13,912	14,760	.00577

* See following.

TREATMENTS

Fertilization

F-1 - 300 lbs./acre 4-12-4 fertilizer broadcast and mixed with soil before planting.
200 lbs./acre 4-12-4 fertilizer sowed in band 2" to side and at same depth of corn seed.
500 lbs./acre 16-0-0 fertilizer applied as side dressing when corn is 12"-18" tall.

F-2 - 500 lbs./acre fertilizer sowed in band 2" to side and 2" below corn seed.
500 lbs./acre 16-0-1 fertilizer applied as side dressing when corn is 12"-18" tall.

Planter

P-1 - Conventional tractor mounted 2-row planter with runner openers.

P-2 - Tractor mounted 2-row planter with double disc openers behind two disc hillers set to throw the mulch away from the row.

Tillage

T-1 - Double-cut plow - 3" top 4" bottom - plus twice over with spring tooth harrow.

T-2 - Double-cut plow - 3" top 4" bottom - plus one discing followed by one spring tooth harrowing.

T-3 - Double-cut plow - 3" top 4" bottom - plus one spring tooth harrowing followed by one discing.

T-4 - Conventional turn plow - 7" depth - plus two discings."

Soil Moisture and Nitrates as Influenced by Autumn Rainfall on Winter Wheat Land - M. M. Oveson, Pendleton, Oregon.-"Soil moisture and soil nitrate determinations made on the Lester King farm on September 18 and December 21, 1950 showed some very interesting results. Soil moisture on September 18 taken at three locations showed an average of 10.5 percent in six feet of soil. This moisture was well distributed through the six-foot column ranging from a little less than 9 percent in the surface foot to 11.4 percent. On December 21 soil samples taken from the same location showed an average soil moisture of 17 percent. Every foot for the full six foot depth showed some increase in soil moisture with the maximum increase coming in the first four feet. There had been 6.55 inches of rainfall during this period. Of the 6.55 inches which had fallen on the land, 92 percent could be accounted for in the increase in soil moisture. This is a remarkable high percent moisture conservation. Up to December 21 there had been no sign of any water runoff, even on the extremely steep hillside. Since that time, there has been some runoff with minor erosion occurring. This field has grown peas for the past 2 years and therefore has absolutely no straw residue which might act as a binder left in the soil. We could hardly hope to get by a winter with as much moisture as has fallen this winter without experiencing some runoff under these conditions.

"Nitrate nitrogen determinations made on the same 2 dates showed a minor increase in nitrates on December 21 as compared to September 18. There was a marked difference in the placement of the nitrates. On September 18 the nitrate nitrogen was concentrated in the surface foot with less amounts in the second and third feet. On December 21 the high nitrate concentrations were in the second and third feet with little more than traces in the first foot and small amounts in the fourth foot and on down. This nitrate determination reveals an interesting pattern showing the downward movement of available nitrates with the soil moisture. The wheat which was seeded on this farm emerged in October and had established fair growth. I am sure that the roots are down into the soil where they will pick up this nitrogen when growth is resumed in the spring. The data for different slope aspects are shown in the following table.

SOIL MOISTURE AND NITRATES-KING FARM

September 18, 1950			December 21, 1950		
Foot	Moisture %	NO_3 P.p.m.	Foot	Moisture %	NO_3 P.P.M.
		SOUTH EAST SLOPE			
1	8.7	20	1	23.0	7
2	10.5	13	2	18.3	36
3	11.1	8	3	17.0	16
4	11.4	7	4	15.7	12
5	11.4	4	5	13.8	8
6	11.4	3	6	12.5	7
Ave.	10.8	55	Ave.	16.7	86
Inches water	9.96		Inches water	15.42	
		TOP OF RIDGE			
1	8.2	26	1	24.4	9
2	10.5	19	2	18.5	17
3	10.2	13	3	16.7	26
4	10.5	9	4	15.3	16
5	10.6	7	5	13.8	13
6	10.1	5	6	11.6	7
Ave.	10.0	79	Ave.	16.7	88
Inches water	9.24		Inches Water	15.42	
		NORTH SLOPE			
1	10.0	42	1	25.0	9
2	11.4	17	2	19.2	36
3	11.0	17	3	17.6	26
4	11.0	9	4	16.4	15
5	11.0	7	5	15.3	13
6	10.4	6	6	12.6	10
Ave.	10.8	98	Ave.	17.7	109
Inches Water	9.96		Inches Water	16.38	

Rainf 11 at Hill farm during period September 18 to December 21, 1950 - 6.55

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio.-"Of the 2.45 inches of precipitation for the month, about 2 inches fell as rain. There was no period of heavy rainfall. Surface runoff rates were very low. Total runoff from the small single-crop watersheds ranged from about 0.1 inch on the sod areas to 1.0 inch on the wheat areas. Seeps and springs flowed heavily. Stream flow from the 300-acre watershed which totaled about 4 inches was made up mostly of ground-water flow. Percolation from the bottom of the 8-foot lysimeters ranged from 3 to 4 inches.

"Maximum snow depth of 10 inches occurred early in the month. Frost penetration which was maximum in the wheat fields - did not exceed 1.5 inches. Frost in the gravel and dirt roads where the snow had been removed must have been quite deep. By mid-February the frost had gone out of the road surfaces. From February 18 to 28, all of the roads to the Research Station were impassable - that is - for the ordinary passenger vehicle. Even trucks and high-clearance vehicles became mired in the mud. "Old timers" in the vicinity had never seen road conditions so bad.

"Mr. Dreibelbis reported that organic matter determinations for soil samples taken from the 1950 mulched and plowed corn plots showed a good amount of organic matter throughout the entire depth of topsoil in both treatments. Apparently, the disking process has not (yet) tended to develop a shallower depth of topsoil - as some have feared."

Date sampled	Soil depth (inches)	Organic matter in soils (percent by weight) Plowed plots	Disked plot
4-17-50 1/	0-1	2.52	3.14
	1-4	2.28	2.46
	4-7	2.40	2.64
9-15-50 2/	0-1	2.30	2.83
	1-4	2.62	2.34
	4-7	2.07	2.08

1/After completion of first rotation; before disturbing sod for corn.
2/After corn harvest.

Hydrologic Studies - R. W. Baird, Blacklands Experimental Watershed, Waco, Texas.-"During the month of February rainfall at Station No. 69 totaled 2.39 inches as compared to the normal of 2.37 inches. This is the first month since February 1950, that the rainfall has exceeded the normal for Waco at this project. Total rainfall for the period from the first of October through January 31, 1951, was only 3.89 inches as compared to a normal of a little over 10 inches. This excessively dry weather during the fall and winter months seriously damaged all winter grains and legumes. The rains of February included 0.99 inch of sleet, freezing rain, and snow on the 13th and 14th and 1.26 inches of rain on the 18th. The rain of February 18 caused no runoff from field areas, although there was a very small flow through some of the runoff stations where drainage is collected from roadsides, packed farm lots, and similar areas.

"The moisture conditions now are very similar to 1949. In the top 24 inches, there is plenty of moisture for corn planting. However, the lower depths show a deficiency in comparison to 1949 and 1950 conditions at this time. Samples taken on February 21 on cropland in the Y and W areas showed the following percentages of moisture at the designated depth intervals:

Y Area: 0-6 inches, 30.1 percent; 6-12 inches, 28.1 percent; 12-24 inches, 28.1 percent; 24-36 inches, 23.6 percent; 36-48 inches, 25.6 percent; 48-60 inches, 27.2 percent.

W Area: 0-6 inches, 28.9 percent; 6-12 inches, 28.8 percent; 12-24 inches, 29.4 percent; 24-36 inches, 24.7 percent; 36-48 inches, 23.0 percent; 48-60 inches, 23.1 percent.

"Most of the fall seeded oats were killed by the recent cold weather. They were in a weakened condition due to the lack of moisture. Fields where 50 percent or more of the stand was killed have been replanted and are up to a good stand. All of the Hubam and Madrid clover had to be planted over. Only about 10 percent of the Dixie Wonder Peas survived. Bur Clover is beginning to show up again in the pastures and meadows. Dry weather last fall killed the first stand, cold weather the second, and it is back to a stand for the third time. This reseeding ability makes it the most dependable pasture and meadow legume for this area."

Hydrologic Studies - J. A. Allis, Central Great Plains Experimental Watershed, Hastings, Nebraska.-"Temperatures during February were about 3.2 degrees above the long-time average. During the month we received 1.64 inches of precipitation which was badly needed. On February 24 and 25, intermittent light showers produced 0.75 inch of rain which thawed the ground out and on February 28, we received 0.72 inch of rain which fell in less than 2 hours. If the rain of February 28 had not been preceded by the light showers on February 24 and 25, we would have had practically 100 percent runoff on February 28. As it turned out, there was only a moderate amount of runoff from each storm.

"The following table shows the average yields for the past 4 years on our 4-acre watersheds. The watersheds since 1947 have been in the same treatment, either straight row, contoured or subtilled, while prior to this time the practices were rotated:

Table 1.--Average yield-1947-1950 in bushels per acre on approximately 4-acre Watershed near, Hastings, Nebr.

		1947	1948	1949	1950	Average
Corn	Straight-row	14.4	23.0	28.4	26.6	23.1
	Contoured	20.9	28.7	33.6	31.4	28.6
	Subtilled	20.7	29.7	28.5	33.8	28.2
Oats	Straight-row	12.8	13.8	9.9	9.0	11.4
	Contoured	15.2	15.4	7.0+	8.4	11.5
	Subtilled	9.1	13.7	6.1+	8.5	9.4
Wheat	Straight-row	19.7	(1)	(1)	9.2	
	Contoured	26.6	(1)	(1)	11.4	
	Subtilled	17.7	(1)	(1)	9.4	

1/Oats substituted in place of wheat because of poor stands of wheat in the spring of year.

+Same damage due to green aphis.

"This table was compiled to show the increase, if any, in yields due to continued conservation practices since the same watersheds were in the same practice and the same crop in 1950 as they were in 1947.

"In 1950 subtilled corn yielded 7.2 bushels more to the acre than straight rows. On the same watersheds in 1947 the subtilled corn yielded 6.3 bushels per acre more than straight row corn.

"In 1950 subtilled oats yielded 0.5 bushel less than straight row while in 1947 the straight row yielded 3.7 more.

"In 1950 subtilled wheat yield 0.2 bushel more than straight row while in 1947 the straight row yielded 2.0 bushels more per acre."

Hydrologic Studies - R. B. Hickok, Lafayette, Indiana.-"February precipitation was about 70 percent above 'normal.' A rainfall of slightly less than a half inch on the 18th fell on frozen soil and produced generally heavy runoff for which good records were obtained. These data are not yet compiled.

"Mr. Stoltenberg has done a lot of work checking nutrient loss data accumulated since 1942 and has developed characteristic regression relationships between the concentrations of the nutrient components of the eroded material and the concentrations of total solids in the runoff. These characteristic relationships will be very useful as a basis for preliminary checking of subsequent determinations and for estimating the nutrient losses for periods of incomplete record.

"Soybeans in 40-inch (corn-row width) rows have been included in the crop rotation on the experimental watersheds since 1947. Three year's data so far obtained indicate erosion losses from beans somewhat lower than for corn, in spite of the fact that they are the second cultivated crop in the rotation. The conservation treatment has been very effective in reducing the soil and nutrient losses, to a third or less than the losses under the prevailing treatment. Runoff losses during the growing season have so far been similar to those from corn indicating that the conservation treatment will generally save an inch or more of rainfall for use by the crop.

"The only difference in handling of the beans on the prevailing and conservation treated watersheds is contour rowing of the latter. No fertilizer is applied for beans in either treatment. There is undoubtedly a residual effect of heavier fertilization of other crops in the rotation on the conservation treated watersheds, as indicated by much more rigorous growth of weeds on these watersheds unless the beans are kept well cultivated. The 1950 yields were previously reported to average 30 and 39 bu./A for the prevailing and conservation treated watersheds, respectively. The average runoff and erosion losses for the 1950 growing period of the beans are reported in the following table:

Table 1.--1950 runoff and erosion losses[1] from experimental watersheds in soybeans[2]
Purdue-Throckmorton Farm, Layfayette, Ind.

Type of Mgt.	Runoff	Erosion	
		Soil	Org. matter
Prevailing	3.78 in.	6 + t/a	370 lbs./a
Conservation	2.11 "	2-1/2 t/a	187 "
Difference	1.67 in.	3-1/2 t/a	183 lbs./a

1/ Av. of two watersheds per treatment, approx. 3 acres each.
2/ For growing season, from starting of seed-bed preparation to harvest.

"Mr. Crain, of the Station staff, has made extensive analyses of the 6-year results to date of the crop residue and mulch tillage studies which has revealed some important points. Comparison of yields results for the several experimental mulch treatments with those from the conventional plow treatment for the Albion (and former Cromwell) experiments on well-drained soils in the northern part of the State shows that several have given higher yields for four out of the 6 years. And, the 6-year average yields show one slightly higher than plowing and two others highly competetive. It was found that the highest yielding treatment had also been the least erratic in comparison with the conventional plow treatment.

"This treatment has been referred to in our previous reports as No. 5. It is essentially one of mixing the meadow residues into the upper 2-3 inches of soil and subtilling to the usual plow depth. This method of seedbed preparation has been accomplished for the past several years by means of the Oliver 'TNT' plow, running the upper shear (with the moldboard) to a depth of only 3 inches, while running the lower shear 7 inches deep, thus inverting the turf and subtilling beneath it. After a few days inversion, the sod is cut up and mixed with the soil while finishing the seedbed with a dis-harrow. Subsequent planting and cultivation operations have been accomplished with the conventional equipment, except for substitution of a stub runner for the usual curved runner opener on the planter.

"Baugh[1] found 2.8 tons per acre of undecomposed residue in the upper 2 inches of soil late in August, following this method of seedbed preparation for corn, compared with 0.8 ton per acre following the conventional plowing method. It has been apparent from observations made on the experimental plots over several years that erosion losses under this experimental treatment have been substantially less than on the plowed plots."

[1] 'Some Results of Mulch Tillage for Corn,' E. R. Baugh et al, 'Agri. Engin.' V. 31, No. 8, Aug. 1950.

Hydrologic Studies - L. H. Stolzy, East Lansing, Michigan.-"Precipitation for the month of February, as measured by the U. S. Weather Bureau type of standard nonrecording rain gages, amounted to 1.39 inches at the cultivated watersheds, 1.56 inches at the wooded watershed, and 1.40 inches at the stubble-mulch plots. These amounts are approximately 73 percent, 82, percent, and 74 percent, respectively, of the 50-year average February precipitation of 1.90 inches. February precipitation can be expected to equal or exceed 1.90 inches once in 2.40 years.

"Both watersheds 'A' and 'B' contained a frost layer on February 1. This frost layer extended from zero to approximately 12 inches in both watersheds, reaching its maximum penetration of the soil profile on the 9th and 10th of the month, when a minimum of 12 degrees below zero was recorded. This frost layer was partly removed by higher temperatures at the end of February, at which time there was a frozen condition in the soil from the 3-inch to 9-inch depth.

"There were two periods of runoff during the month of February at the cultivated watersheds which totaled over 2 inches in amount. These periods, for both watersheds, extended from February 11 to 13, inclusive, and 16th to 20th, inclusive. The first period of runoff was due to the rains of February 11 and 12 and snow melt. This reduced the snow layer from 6 inches to 3 inches in depth. The second period of runoff was due to the rains on the 16th, 18th, and 19th of February and snow melt. This left the ground without a snow cover and remained as such throughout the rest of the month. All runoff was caused by the frost layer that was in the soil throughout the month. There was no runoff at the wooded watershed for February 1951.

"On February 6 Mr. George W. French from the Bureau of Plant Industry called at this office to obtain precipitation data for June, July, and August 1951. This is to be used in connection with a study he is making with sugar beets.

"On February 14 Mr. L. L. Harrold met with the following men interested in the Rifle River Project: Mr. . H. Tody and Mr. O. H. Clark, in charge of the Rifle River Watershed Program; Mr. C. A. Engberg and Mr. L. J. Bartelli, State Soil Scientists; Mr. Earl E. Fenton, District Conservationist; and Lewis H. Stolzy, Acting Station Supervisor. The purpose of the meeting was to discuss in detail with Mr. L. L. Harrold the type of data that should be collected under different conservation practices, the main emphasis being put on collection of hydrologic data on small watersheds under different types of cover and with different management practices. The other phase of the discussion was concerned with procedures and the cost of instrumentizing these various watersheds."

Hydrologic Studies - T. W. Edminster, Blacksburg, Virginia.-"Continued analysis of published runoff data for detention-discharge relationships of surface flow proved exceptionally interesting in the case of data from the demonstration project operated at Coon Valley, Wis., during the period 1934 to 1940. As indicated in SCS-TP-46, February 1942, two watersheds were chosen of similar size and terrain. Coon Creek watershed was 77.2 square miles in area and the Little LaCrosse watershed was 77.1 square miles. During the period 1934 to 1938, the Coon Creek watershed progressively converted 100 percent to conservation farming while the Little LaCrosse was left as a check.

"Analysis of runoff data indicated detention-discharge relationships as presented in the following table:

Rate of runoff	Coon Creek Watershed		Little LaCrosse Watershed	
	1935	1938	1935	1938
	Surface inch	Surface inch	Surface inch	Surface inch
0.02	0.045	0.090	0.123	same as
.04	.093	.175	.245	1935
.06	.140	.263	.370	
.10	.230	-	.615	
.16	.365	-	-	

"At least two storms were analyzed for each year given in the table and values of detention are averages of two values or more. Primarily, it is evident that the detentions are considerably heavier on the Little LaCrosse than on Coon Creek. This accounts for the lesser peak rates of runoff obtained on the former since excess rainfall had to supply greater detentions and thereby less water was available for runoff. A notation in SCS-TP-42 indicates 10.0 percent of the LaCrosse watershed was in first bottom land whereas only 7.1 percent of the Coon Creek watershed was in first bottoms. Regardless of what caused the differences in detentions on the two watersheds, this difference does explain the greater runoff yield from the conservation watershed.

"Effects of the conservation practices on the Coon Creek watershed are evidenced by the increase in detention for a given rate of runoff between the years 1935 and 1938. Notice that no such increases occur on the unchanged Little LaCrosse watershed. Although the effects of the conservation program had not yet produced the same detentions as naturally existed upon the check watershed, it is evident from the 1938 detention-discharge relationships that much had been accomplished. The

The extent of this accomplishment could be further visualized in terms of peak rates if these detention-discharge relationships were applied to a given storm as per the method of H. N. Holtan and M. H. Kirkpatrick (Suggested Method for Estimating Runoff - June 1950 - In-Service Report)."

The above was reported by Messrs Holtan and Kirkpatrick.

Hydrologic Studies - A. W. Cooper, Auburn, Alabama.-"The February rainfall of 1.84 inches represents 34 percent of the 70-year average of 5.48 inches for Auburn.

"In cooperation with SCS Operations personnel, 24 infiltration measurements were made using the simulated rainfall type-F infiltrometer (table 1, next page). These tests were made in Mobile and Baldwin Counties on Rustom S. L., Greenville S. C. L., Rustom F. S. L., Irvinton F. S. L., Carnegie F. S. L., $2M42d_2$, Rustom L. S., Irvington Flat Phase, 2L43, and Plummer sand.

"Mr. Carter reported permeability determinations on two soils (table 2) and mechanical analyses on one (table 3). These tables appear on the next two pages.

"Messrs. Sanders and Cooper spent the week starting February 26 laying out row arrangements on the Agricultural Engineering Farm. The rows were laid out to drain into the water disposal systems constructed last fall. Since the vegetation was not established in the outlets, no terraces were constructed. Rows were laid out to give the rows drainage and so they could be cultivated with multi-row mechanized equipment. The old bench terraces and irregular places in the field were smoothed out with a bull dozer and land leveler before laying out the rows. In two fields the rows were so arranged that there were no point rows in the fields. The maximum row grades were 6 inches per 100 feet except for the first 100 feet on the divide of a ridge which had a maximum of 12 inches per 100 feet."

Runoff Studies - N. E. Minshall, Madison, Wisconsin.-"Precipitation at Edwardsville for the month was 5.11 inches. There were no high intensities and the maximum hourly rainfall was 0.25 inch. Runoff from the watersheds was approximately 3.25 inches. Temperatures varied from a minimum of 17 below on the 2d to a maximum of 63 on the 26th.

"Precipitation at Fennimore for the month was 1.72 inches, most of which came as rain on the heavy snow blanket. Nearly all of the snow had melted by the end of the month leaving the ground bare, yet there was no surface runoff since the soil was frost free due to the snow cover coming early. Temperatures varied from a minimum of 29 below on the 2d to a maximum of 44 on the 11th."

Hydraulic Studies - F. W. Blaisdell, Minneapolis, Minnesota.-"All drafting for the reports covering the studies of box inlet drop spillways was completed during the month. The second rough draft of the research report has been completed and on the 19th it was submitted to the St. Anthony Falls Hydraulic Laboratory staff for their review and comment. An illustrated example applying the methods outlined in the report for designing box inlet drop spillways was added to the design report during the month. This latter report is also in the second rough draft stage. On the 28th it was sent to the Hydraulic Laboratory, to Mr. M. M. Culp, Head of the Engineering Standards Unit, and to Mr. Edwin Freyburger, Regional Engineer, for their comments and review prior to making final revisions.

Table 1.--Summary of infiltration tests made with the infiltrometer on Alabama soils (February 1951)*

Test No.	Soil type	Soil surface condition	Depth of topsoil	Infiltration: Total 1st hr.	Infiltration: Total 2d hr.	Infiltration: Rate at end of 1st hr.	Infiltration: Rate at end of 2d hr.	Initial soil moisture: Depth (in.) 0-6	6-12	12-18	18-24
			In.	In.		In./hr.		Percent			
49, 50, 51	Ruston S.L.	Good grass and clover sod	8	0.97	0.72	0.72	0.72	11.8	12.8	13.5	13.8
53, 54	Greenville S.C.L.	Bare	7	1.06	.65	.81	.56	12.4	14.0	14.8	15.5
55, 56	Rustom F.S.L.	Bare	8	.94	.53	.61	.49	12.8	12.7	13.7	14.5
57, 58	Irvington F.S.L.	Bare	8	.94	.42	.49	.37	18.8	19.4	22.7	24.5
59, 60	Carnegie F.S.L.	Bare compact	6	.43	0	0	0	20.1	17.9	16.2	15.8
63, 64	Code No. $2M42d_2$ V.F.S.C.L.	Bare	8	.98	.54	.62	.42	19.6	17.4	18.9	18.7
65, 66	Rustom L.S.	Fair grass mulch	9	1.08	.84	.88	.77	9.3	10.1	9.6	9.5
67	Irvington F.S.C.L. Flat Phase	Bare	11	.61	.32	.41	.24	9.7	15.3	17.0	17.5
69	Code No. 2L43	Poor grass sod	6	.79	.47	.47	.47	9.5	11.5	14.0	16.9
71, 72	Plummer L.S.	Poor grass sod	12	.79	.24	.29	.18	24.8	24.8	20.0	18.5

*Data obtained jointly by S.C.S. Research and Operations.

Table 2.--Permeability of soils (Alabama)*

Depth	Field moisture content	Moisture content saturated	Percolation		Volume weight	Water drained	
			Field moisture	Saturated		15 min.	15 hr.
Inches	Percent	Percent	Percent	In./hr.	Gm/cc	cc/100 gm	
Rustom S.L.							
0-3	10.61	25.61	1.96	0.60	1.58	3.49	9.75
11-14	11.43	25.35	1.28	1.53	1.62	2.10	9.53
26-29	10.80	25.99	1.54	2.66	1.59	7.51	9.14
Greenville F.S.L., Constantine Farm							
1-4	11.47	34.28	10.98	1.25	1.34	10.35	13.22
12-15	12.79	23.65	.43	3.75	1.56	7.06	9.71
24-27	14.47	22.78	.37	2.05	1.61	5.15	7.54

Table 3.--Mechanical analysis of soils (Alabama)*

Particle Size	Particle Description	Lloyd - Depth		
		1"-4"	8"-11"	18"-21"
		Corrected average		
Mm.		Percent		
4-2	Gravel	12.95	0.86	1.47
2-1	F.G.	1.99	1.35	1.09
1-0.5	C.S.	4.12	4.50	1.57
0.5-.25	M.S.	6.11	3.99	1.43
.25- .1	Fine sand	19.68	9.23	2.37
.1- .05	Very fine sand	17.35	5.54	10.84
.05- .005	Silt	9.14	14.34	26.55
<.005	Clay	28.66	60.19	54.68
	TOTAL	100.00	100.00	100.00

Textural classification as determined by mechanical analysis:

Lloyd: sandy clam loam - 1"-4"
clay - 8"-11", 18"-21".

*Data obtained jointly by SCS Research and Operations.

"Tests of one drop inlet model were completed, the results analyzed, and the test setup was revised. In the revision the riser depth was increased from two pipe diameters to four pipe diameters. It is hoped that this latter depth will be such that the barrel will flow full without affecting the level of the head pool.

Hydraulic Studies - D. A. Parsons, Minneapolis, Minnesota.-"Drawings for the 1-ft. diameter Coshocton-type runoff sampler were completed. They represent a runoff sampling unit consisting of: (1) a water wheel with sampling head; (2) collecting pan; (3) a 6-inch H flume approach to the sampler; and (4) a support to form an integral unit. This sampler is designed to extract one percent of the H-flume discharge. The laboratory tests show that over the range, 0 to 1/5 cfs, the sampler catch varies between about 1.05 percent and 0.95 percent of the flume discharge. From 1/5 cfs to 1/3 cfs (full capacity) the sampler catch decreases progressively with flume discharge to a minimum of from 0.9 percent to 0.7 percent. Many factors were investigated in an attempt to determine the cause of the progressive decrease in sampler catch at high flows, but the effort was not successful. The current cost of producing these units is about $70 each.

"Earlier tests of a 2-ft. diameter and a 3-ft. diameter sampler of slightly different design suggest that about the same accuracy would be obtained with larger samplers of the current design. The 3-ft. diameter sampler has a capacity of about 5 cfs. However, field trials with a few devices are planned preliminary to preparation of additional construction plans. The head requirement for these devices is about 2-1/2 times the depth of the H flume."

Hydraulic Studies - W. O. Ree, Stillwater, Oklahoma.-"The results of testing the combination vegetation and concrete-lined channel will be presented here. This channel is on a 10-percent slope with a length of 100 feet and a width of 24 feet. The channel is covered with Bermuda grass except for a 4-foot wide concrete gutter down the center. A series of 10 flows ranging from 1.6 c. f. s. to 125 c. f. s. were passed down the channel. The conclusions reached from these preliminary tests were:

1. The capacity of a combination channel can be satisfactorily estimated by summing up the estimated discharges for the component parts. The n - VR design method is used for the vegetation section, and the Manning formula for the concrete section.

2. The values of Mannings n for the concrete gutter section were much higher than anticipated and increased with Reynolds number. A value of 0.026 for n for the relatively smooth concrete chute was obtained for a Reynolds No. of 1,600,000.

3. The high velocities in the concrete gutter section do not carry over appreciably on to the grassed portion.

4. A heavy turf along the gutter edges provided sufficient protection at this point.

5. An adequate stilling basin is needed at the discharge end of the channel.

"Designs have been prepared and materials ordered for the pipe outlet experiment. This pipe outlet will consist of 108 feet of 24-inch concrete pipe, an elbow (85°) and 260 feet of 24-inch corrugated pipe. There will be a maximum head of 14 feet

on the entrance and a 13-foot fall through the system. The loss coefficients for the component parts will be evaluated and the hydraulic behavior of this type of structure observed.

"Final selection of some watersheds for the proposed runoff study has been made. Four adjacent watersheds ranging in size from 15 acres to 530 acres, all in grass, and all with satisfactory culverts to use as measuring devices have been found. Installation of the recording gager will be started as soon as the working plans are approved.

"Some time has been spent on the working plans covering the hydrologic studies at the Cherokee and Guthrie Experiment Station."

Drainage Studies - M. H. Gallatin, Homestead, Flordia.-"While the total rainfall for February was above the average for the past 4 years, all of the rain fell from February 1 to 3, with light showers through February 5, and very light scattered showers on February 11. The average for our gages for the past 5 years for the month of February is as follows; 1951 - 2.19 inches; 1950 - 0.75 inch; 1949 - 0.36 inch; 1948 - 0.25 inch; 1947 - 1.79 inches; 1946 - 1.20 inches.

"Rain fell on 6 days, February 1 through 5 and February 11. Rains of over 1 inch were recorded on all gages on February 2, 1951.

"There has been a steady decline in the water table for the area with the exception of the period January 29 to February 5 when an average of 2.19 inches of rain fell.

"With heavy showers occurring during the early part of the month, February 1 to 5 when 2.43 inches of rain fell in the mulch plot area, readings on all of the plots were very low. From February 5 to the end of the month with no rain falling, readings in the natural cover and check plots increased rapidly and toward the end of the month these two plots, shavings, grass and pine straw, stayed low until the end of the month when there was a gradual increase. Samples collected from all the plot areas show that after almost 3 years the shavings are still not breaking down, or if there is some breakdown the nitrate is being tied up as rapidly as it is released. Physically there is a marked change in the material.

"Readings of the cycle plots in this area show that during this period of the year with a low water table, low rainfall plus high winds the irrigation cycle must be shortened."

Muck Drainage Studies - R. B. Hickok, Walkerton, Indiana.-"S. C. 366, Subsidence of Muck Soils in Northern Indiana,' just published by Purdue University, Agricultural Experiment Station in cooperation with the Soil Conservation Service, reports results of subsidence studies carried out under this project. The authors are H. A. Jongedyk, R. B. Hickok, I. D. Mayer, and N. K. Ellis."

Drainage Studies - T. W. Edminster, Blacksburg, Virginia.-"Mr. Walter Turner, Soil Scientist, has continued his work on the revision of the permeability program for Virginia. During February he submitted for consideration a special check list to be used in recording original field observations or clues. The purpose of this check list is to assure that the observer will give full consideration to all of the important factors thus far found to be necessary for satisfactory analysis of the permeability data, particularly when it is to be correlated with drainage observations.

"On February 12 the project staff held a conference to develop a general outline of work to be covered by the Drainage Engineer during the remainder of this fiscal year. The recommendations made in this conference were as follows:

1. To recommend to SCS Operations to continue to operate the tile drainage investigation on Eastern Shore.

2. To try to arrange for continuing the open ditch investigations on the Norfolk City Prison Farm in Princess Anne County.

3. To clarify the system of reporting data from the Weather Station, Holland with personnel at Tidewater Field Station.

4. To concentrate a good portion of the time to analyzing data collected from existing drainage system investigations.

5. To continue the analysis of data collected from pump-unit investigations with emphasis on the possible effects of diurnal fluctuations of water tables on accuracy of data.

Mr. Walker makes the following report:

"The study of data collected from existing drainage investigations has just gotten under way. It consists of grouping the raw data from each observed site into classes. Each class is based upon the position of the water table in the soil profile, rainfall conditions, and comparable dates of observation. Each class of data is plotted on coordinate sheets to form water table draw-down curves.

"It is not possible to predict at this point what may be obtained from analyzing these water-table curves. However, it has been noted in the preliminary grouping of data from the Moyock soils on the Rawls farm that the effect of tile drainage is reasonably close to the effect of 'pump' drainage of a similar soil on the Lee farm.

"Questions have arisen from time to time concerning the effect of artificial drainage on crop yields. Since this was not an objective in the Project Work Plan, no information is available from trained observers. However, S. W. Lee has estimated the yields of crops planted in the area that was tile drained for tile sedimentation and stabilization studies.

"The following is Mr. Lee's comment on a 3-acre tract lying at the upper end of the tile main:

Year	Crop	Remarks on yields	Precipitation--deviation from normal--March thru September
1946	Corn	good	- 2.21
1947	Peanuts	fair	- 1.72
1948	Corn	good - 72 bu/acre	3.47
1949	Peanuts	fair - 17 bags/acre	15.15
1950	Corn	good - 85 bu/acre	- 3.84

In an adjoining tract lying in the middle of the drained area, peanuts were planted in both 1949 and 1950, with the yield dropping from 17 bags/acre to 11 bags/acre.

"It should be noted that everyone who is familiar with this farm says that these areas produced crops yielding very little--10 bags/acre--before Mr. Lee bought it in 1945. He began using cover crops and fertilizer and, in general, practicing crop rotations at once. All of these factors tend to obscure the effect of the tile drainage installed early in 1947. But it should be noted that there was a substantial yield of peanuts in 1949 which was by far the wettest year considered."

Supplemental Irrigation - T. W. Edminster, Blacksburg, Virginia.-"The wheat seeded on the irrigated and non-irrigated control plots was top dressed with nitrogen. Red clover was also sown on these plots.

Date of Application: February 27, 1951
Rate: 20 pounds per acre of N
10 pounds per acre of Clover
Fertilizer: 16% Nitrate of Soda

"The alfalfa plots were top dressed with 2-12-12 fertilizer at the rate of 600 pounds per acre.

"The Hale portable gasoline pumping unit has been overhauled for the coming season."

Sedimentation Studies - L. M. Glymph, Jr., Lincoln, Nebraska.-"In connection with assistance being rendered the Region 5 Water Conservation Division in its survey of the Salt-Wahoo Watershed in eastern Nebraska, considerable progress has been made in further development of methods for estimating rates of sediment production from information on watershed characteristics.

"Because of similarity of soils, erosion conditions, farming practices, etc., it is believed that the records of sediment production, data on watersheds, and the method of analysis presented by Gottshalk and Brune in their publication, "Sediment Design Criteria for the Missouri Basin Loess Hills," SCS-TP-97, are elements of basic data which can be used for purposes of the Salt-Wahoo survey. In that publication the authors developed the following regression equation:

$$\text{Log } S = 0.7664 \log 100 W + 0.7867 \log T + 1.0545 \log E + 0.3701 \log C_T/W - 2.9127$$

Where S = Total sediment accumulation in the reservoir, in tons
W = Net drainage area, in square miles (excluding area of reservoir)
T = Age, in years
E = Rate of gross erosion, in tons per square mile per year
C_T/W = Capacity-watershed ratio of combined flood and conservation storage, in acre-feet per square mile of drainage area

"The above equation is recommended for use in the Loess Hills area to estimate the total amount of sediment to accumulate in reservoirs of the type described in the publication over a period of years. It stresses progressive accumulation in reservoirs of a specified capacity-watershed ratio during a specified period of time. The equation serves a definite purpose but is not well suited for direct application in the Salt-Wahoo survey where primary interest is in the average annual rate of sediment production irrespective of the type of reservoir.

"To better adapt it for purposes of the Salt-Wahoo survey, working with Mr. H. G. Heinemann, Region 5 Sedimentation Specialist, the data in SCS-TP-97 have been subjected to further analysis. First the mean trap-efficiency of the 30 reservoirs

presented in table 2 of the publication was determined and the measured sediment accumulation adjusted for trap-efficiency using the standard trap-efficiency curves. Then using the adjusted average annual rate of sediment production and the estimated annual rate of gross erosion from table 7 of SCS-TP-97 as variables, the following equation was developed by regression analysis

$$\text{Log } S = 1.15298 \log E - 0.28141 \log 100 W - 0.62849$$

Where S = Average annual sediment production in tons per square mile
E = Rate of gross erosion in tons per square mile per year
W = Net drainage area, in square miles (excluding area of reservoir)

"The above formula seems to give reasonably good relationships between computed and measured rates but probably can be improved by inclusion of other variables. One important factor not now included is the effect of rainfall. Data on rainfall are now being tabulated for use in running another regression analysis."

Sedimentation Studies - R. Woodburn, State College, Mississippi.-"Emphasis has been placed upon the sedimentation curve now under way in the Upper Yazoo Watershed for the past month.

"Zero weather on the 1st and 2d and deep ice and snow prevented field work. Four-inch ice on the ponds and almost impassible field and rural roads also prevented field work until February 12. A great deal of effort was made to plan the order of surveys so that the field party could work every possible moment on account of the time lost by weather. The reservoirs were surveyed February 12 to 28 including the two fairly large lakes at Maywood, Lake Shahkoka and Lake Woodland. The order of surveys on the field work completed to date is as follows:

No.	Name	Location	Date
1	O. P. White	Marshall Co.	1/15/51
2	C. H. Hunnesucker	Marshall Co.	1/16/17/51
3	C. S. Hurdle	Marshall Co.	1/17/22/51
4	Agnes Jones	Marshall Co.	1/23/24/51
5	Johnson	Marshall Co.	1/25/26/51
6	P. T. McAlexander	Marshall Co.	1/26/51
7	Mrs. F. J. Marine	Marshall Co.	2/12/15/51
8	Lake Shahkoka	DeSoto Co.	2/14/19/51
9	Lake Woodland	DeSoto Co.	2/20/21/51
10	C. L. Patton	Marshall Co.	2/21/51
11	C. B. Langston, Jr.	Marshall Co.	2/22/51
12	Fletcher Hurdle (north)	Marshall Co.	2/22/23/51
13	Fletcher Hurdle (south)	Marshall Co.	2/23/26/51
14	C. C. Stevenson	Marshall Co.	2/26/51
15	Gayoso Lake	DeSoto Co.	2/27/51
16	Ben O. Pettis	Lafayette Co.	2/28/51

"Most of these surveys have been rather straightforward except No. 7, Mrs. F. J. Marine (one called Greene) or Lake Mimosa just above Spring Lake State Park. Here sediments of 6 to 8 feet in thickness were found. The elevation of bottom of sediment was several feet below natural ground on the lower side of dam.

"Apparently, there was considerable valley aggradation before construction of Mimosa dam some 20 years ago. I am of the opinion there has been some influence of Spring Lake for some distance above its head, in fact up to the area occuped at present by Mimosa. The history of Spring Lake goes back for nearly a 100 years."

Table 1.--Water distribution pattern for Perf-O-Rain pipe
(1950 tests)

Type	Ave. Wind perpend-dicular to center line of pipe, mph.	No. of tests	Average rate of application - inches per hour													
			Distance from center line of pipe, feet												Average to	
			1	3	5	7	9	11	13	15	17	19	21	23	18'	23'
C 1"/hr.	Windward side 1.9	3	1.51	1.21	1.03	0.95	0.95	0.98	1.03	1.05	1.03	0.94	0.73	0.39	1.10	1.02
															1.12	1.05
	Leeward side 1.6	2	1.46	1.27	1.14	1.06	1.01	.99	.98	.99	1.01	1.01	1.01	.98	1.14	1.07
E 3/4"/hr	Windward side 3.2	2	.82	.79	.76	.74	.73	.71	.68	.64	.56	.45	.30	.10	0.71	0.64
F 1/2"/hr	Windward side 1.3	5	.94	.77	.69	.66	.67	.70	.71	.70	.63	.50	.26	.10	.73	.62
															.70	.60
	Leeward side 2.2	3	.89	.76	.68	.65	.64	.63	.63	.60	.54	.43	.26	.00	.67	.58

1. For each test 6 samples were collected at each foot from the center line of the pipe. The rates shown are the averages as determined from a third degree curve fitting the experimental data.
2. The pressures were adjusted in all tests until the total coverage was 46 feet (the width of the experimental plots being irrigated with the Perf-O-Rain pipe)
3. The above table is abstracted from a Research Progress Report entitled "Water Distribution Pattern Analysis for Perf-O-Rain Pipe" written by Dr. Vaughn E. Hansen February 1951 reporting cooperative research between the Utah Agri. Experiment Station and the Division of Irrigation and Water Conservation, Soil Conservation Service.

IRRIGATION AND WATER CONSERVATION DIVISION

Irrigation Studies - Vaughn E. Hansen, Logan, Utah.-"From the table which appears on the next page which summarizes in part recent studies on the characteristics of Perf-O-Rain pipe used for sprinkler irrigation, the following conclusions can be drawn:

1. For all types, the application rate near the pipe is excessive.

2. For types C and F, the average application is considerably in excess of the rated application.

3. The types E and F even though rated differently have nearly the same application rates.

Snow Surveys - B. Peterson, Phoenix, Ariz.-"During the month, one snow survey bulletin was published and two survey reports made. Three newspaper articles were given. The storm of March 2 and 3 left an exceptionally heavy snow cover over the Northern part of the State. However, high winds will probably remove much of it. Streamflow has been below normal, as has precipitation."

Snow Surveys - H. J. Stockwell, Ft. Collins, Colorado.-"The February 1 snow reports for the Platte, Arkansas, Colorado, and Rio Grande drainages were published on February 8. Snow cover ranges from about 200 percent of normal west of Denver along the continental divide to about 20 percent of normal in northern New Mexico. In Wyoming snow cover is 115 to 150 percent of normal. Record snow cover was measured on some courses on the headwaters of the South Platte, Arkansas, and Blue Rivers. This area is along the continental divide from about 40 miles northwest and 75 miles southwest of Denver. It is anticipated the snow accumulation during February will be average or above.

"A tentative program for the Rio Grande Forecast Committee has been outlined. The program is now under consideration by various agencies. The meeting date is planned for April 13, 1951, in Albuquerque, N. Mex."

Snow Surveys - W. D. Criddle, Boise, Idaho.-"The snow surveys made on or near the first of February were summarized and the Snow Survey and Water Forecast report was released on February 9. The entire Columbia Basin showed above normal snow-water content for this time of year."

Snow Surveys - C. E. Houston, Reno, Nevada.-"Unless the State is visited by heavy March storms we may feel that the rains of last fall, which brought floods, were a blessing in disguise. Over a large portion of the State snow stored water is near normal or below. The Humboldt Watershed is about normal, the east central and southern part of the State is suffering from drought. The eastern Sierra is below normal with regard to snow cover but practically all reservoirs are full or retained at a maximum safe level."

Snow Surveys - R. A. Work, Medord, Oregon.-"Mr. Frost prepared a special analysis of propsective Owyhee River runoff in response to SCS for U. S. B. R. The Bureau Manager wished to know how much water he could safely dump from Owyhee reservoir in order to use the reservoir this year to control flood.

"R. A. Work, Dr. H. G. Wilm, U. S. Forest Service and M. W. Nelson, SCS, completed their preparation of a Technical Paper of Oregon State College series entitled 'Use of Snow Surveys in Regulation of Columbia River Floods,' The paper will be ready to submit to all of the cooperating agencies for approval within a few days. This paper is intended for delivery at Western Snow Conference, Victoria, B. C., April 19, 1951.

"R. A. Work prepared and submitted for approval, prior to presentation at the Victoria meeting, a technical paper entitled 'Evaluation of Over-Snow Machines for Snow Survey Work.'

"Another circular was also prepared and submitted for SCS In-Service use entitled 'Flood Forecasting from Snow Surveys.'

"R. T. Beaumont and R. A. Work conducted some field tests aimed toward development of a more practical snow tube cutter for deep dense snow, together with tests intended to supplement those of other workers in the West, relative to effect of machine travel on snow courses.

"The staff at Medford continued their tests of the Frandee No. 4 Sno-Shu over-snow machine - pilot model. The machine has now been operated more than 500 miles over snow. We are preparing to forward our final conclusions and recommendations to the manufacturer - Utah Research Foundation.

"Water supplies for nearly all areas of the State seem assured, but with minor exceptions.

Cloud Seeding

"Mr. Beaumont completed arrangements for OSC Spectroscopic analysis of snow and rain samples for silver iodide content over a geographical area including most of Oregon and parts of Washington and Idaho.

"Messrs. Marshall and Brannan continued through the month their weekly 2-day Sno-Cat rounds to the southern Oregon cloud-seeding gages. Snowfall in this 200-square mile target area is so much less than in the entire surrounding perimeter of mountains as to be very noticeable."

Imperial Valley Drainage Investigations - G. B. Bradshaw and W. T. Gish, Imperial, California. "The fifth and final leaching run has been completed on the heavy textured 140-acre Wilson leaching plot. The last run was for 136 days which made a total of 334 days under ponded water. During this time 2,963 acre-feet of water was applied to the plot, or about 21.2 feet. Of this, 2,963 acre-feet applied 57 percent was surface wasted, 3.8 percent was removed by the tile drainage system, 36.5 percent was lost to evaporation and 2.7 percent was computed to deep seepage. During the total leaching period 5,673 tons of salt were removed from the plot. This averages about 40.5 tons of salt removed per acre. Soil samples to 20 feet indicate that another 40 to 60 tons of salt was pushed or removed to depths of 3 to 20 or more feet. Some of the salt that is pushed to a lower depth will slowly come back up and be removed by the tile drainage system. The surface waste appears high, however, considerable salt is removed from the top few inches of the soil by the ponded water. During the fifth run the surface waste was restricted and 2.4 tons of salt per acre was left on the surface. This 2.4 tons of salt had to be removed by the tile drainage system or pushed to a deeper depth. The plot is still relatively high in salts and will require several years of close attention before normal production, for this heavy type of soil, can be expected. The table on the next page is a summary.

Item		First run	Fifth run
		Dates	Dates
Water applied		3/3/49	4/18/50
Water turned off		4/1/49	8/31/50
Surface waste started flowing		3/14/59	5/9/50
Surface waste stopped flowing		4/15/49	9/19/50
Tile discharge increase		3/4/49	4/20/50
Tile discharge to normal		5/12/50	10/14/50
Peak tile discharge occurred		4/1/49	7/27/50
Peak saline concentration occurred		4/29/49	4/21/50
Preleaching soil sampling		3/1/49	4/13/50
Postleaching soil sampling		5/6/49	10/31/50
	Units	Results	Results
Net area leached	Acres	140	140
Duration of leaching	Days	30	136
Total water applied	Acre-feet	188	1,136
Total salts applied in water	Tons	243	1,610
Total water surface wasted	Acre-feet	63	506
Total salts surface wasted	Tons	380	1,263
Total water from tile system	Acre-feet	14.1	45.2
Total salts removed by tile system	Tons	858	1,463
Average daily tile flow	Acre-feet	.47	.33
Rate of salt removed per day by tile system	Tons	28.6	10.8
Peak tile discharge	G. P. M.	79	86
Peak saline concentration of effluent	T. A. F.	66	49
Total net salts removed from plot	Tons	895	1,115
Net salts removed per acre	Tons	6.4	8.0
Net salts removed per acre-foot of water used	Tons	4.7	1.0
Total evaporation from plot	Acre-feet	103	554

Assistance to Operations - Sedimentation - V. S. Aronovici, Pomona, California.-"Laboratory work was completed on the soil and sediment samples taken from the Marino Reservoir, San Diego County, Calif., for the Regional Soil Conservation Service, Flood Control Office. Mechanical analyses and speific yield tests were made of 44 samples. The results were analyzed, summarized, and the results, together with an interpretation of the data transmitted to Elliott Flaxman.

"There are no standardized techniques of determining specific yield applicable to conditions encountered in the reservoir. Consequently, it was necessary to utilize a practical method based upon generally accepted laboratory techniques relating the character of the desorption curve to yield. Briefly, specific yield may be established by estimating field capacity and total porosity.

"For light to coarse-textured soils, field capacity can be estimated by the water retained against a tension of approximately 100 centimeters tension while medium to fine-textured soils show better correlation with 330 centimeters tension. In some soils or sediments, there seems to be no definite values for comparison. Usually, the desorption curve indicates a rather distinct point where the ratio of water extracted with increase in tension is reversed. Tabulated on the next page are given a selected group of observations, together with estimated values of specific yield.

Table 1.--Estimated specific yield values, based upon soil moisture retained against several tensions of sediments, Marino Reservoir, San Diego County, Calif.

No.	Volume weight	Total voids	Cumulative total soil moisture removed by tensions of 1/				Estimated specific yield 2/
			40	60	135	330	
	Ratio	Ins./in.	Ins./in.	Ins./in.	Ins./in.	Ins./in.	Ac. ins. per ac. per inch of soil depth
91	1.23	0.49	0.06	0.18	0.33	0.34	0.33
92	1.50	.38	.19	.25	.28	.29	.28
97	1.11	.52	.04	.09	.31	.41	.41
109	1.17	.54	.04	.04	.06	.08	.06
111	1.17	.34	.02	.03	.09	.22	.22

1/Cumulative total values are computed by subtracting the moisture content of each tension from the original total voids.

2/Specific yield values actually based on plotted curve, but these values indicate approximately where they would fall.

Consumptive Use - Lake County - H. F. Blaney, Los Angeles, California.-"Water use studies were continued in the Scotts Valley-Upper Lake and Big Valley soil conservation districts in Lake County, in cooperation with the California State Division of Water Resources and the Operations Division, Soil Conservation Service. Rates of consumptive use were computed for 16 classifications of irrigated crops for the winter and irrigation season. Monthly rates of water consumption by alfalfa are shown in the following tabulation:

Month	Coefficient (k)	Consumptive use factor (f)		Consumptive use (u)	
		Scotts Valley and Upper Lake	Big Valley	Scotts Valley and Upper Lake	Big Valley
				Inches	Inches
April	0.70	4.85	4.89	3.4	3.4
May	.70	5.92	5.91	4.1	4.1
June	.80	6.64	6.69	5.3	5.3
July	.90	7.44	7.65	6.7	6.9
August	.90	6.85	7.12	6.2	6.4
September	.80	5.56	5.72	4.4	4.6
Total	-	-	-	30.1	30.7

u = kf = monthly consumptive use.

Phreatophytes - Lower Colorado River - H. F. Blaney, Los Angeles, California.-"Compiled consumptive use coefficients for salt cedar, cottonwood, baccharis and mesquite in Safford Valley, Ariz., (based 100 percent volume density and actual measurements of consumptive use and temperatures), for the U. S. Bureau of Reclamation. These are shown in the table appearing on the next page. Corrections are necessary before applying to field conditions as the areal densities of vegetation range from 50 to 75 percent.

Classification	April 1 to October 31			November 1 to March 31			Annual		
	U	F	K	U	F	K	U1/	F	K
	Inches			Inches			Inches		
Native vegetation									
Salt cedar	82.45	45.36	1.82	3.95	16.83	0.23	86.40	62.19	1.39
Cottonwood	67.07	45.36	1.48	4.93	16.83	.29	72.00	62.19	1.16
Baccharis	50.40	45.36	1.11	6.00	16.83	.36	56.40	62.19	.91
Mesquite	36.99	45.36	.82	2.35	16.83	.14	39.34	62.19	.63

$K = \frac{U}{F}$, where U = consumptive use in inches, and F = consumptive-use factor determined from mean monthly temperatures and percent of daytime hours.

1/Average of determinations made by tank and transpiration-well methods by the Geological Survey of the U. S. Dept. of Interior.

Water Spreading - San Joaquin Valley - D. C. Muckel, Pomona, California.- "Percolation rate data collected during the calendar year at each of the test ponds of the Minter Field and Wasco groups have been plotted and all pertinent information such as treatments, depth of water, soil-moisture content during 'off' periods, etc., has been summarized on the graphs. This work was done in offices of the Kern County Land Company. Fifteen-day average rates were computed for all test ponds.

"Ponds containing dense growths of Bermuda grass and cotton-gin trash continue to show by far the higher percolation rates. A pond containing Paragrass has also shown high rates.

"On one pond, an application of gin trash was given and then lay idle for 1 year. The long dry period occurring between the treatment and the actual spreading of water apparently had no detrimental effect on the treatment. Two ponds previously treated with gin trash 4 and 6 years ago were given a second application and incubation during the year. Peak rates of 18 feet per day were obtained as compared to peaks of 5 feet per day in untreated ponds. On all ponds given gin-trash treatments, 6 years previously and no subsequent treatments other than drying and spading, continue to show beneficial effects from the original gin-trash treatments.

"Applications of chopped alfalfa, redwood sawdust, auger holes drilled to a depth of 20 feet and back-filled with gravel have not been effective to the extent of other treatments. The sawdust treatment has not been completed and a run remains to be carried out where the sawdust is turned under.

"Several of the tests are now designed to work out the most effective operating program using the gin trash and Bermuda grass ponds. Such a program must take into account long drought periods, length of incubation period, duration of run on a treated area so as to obtain maximum average rates with drying periods interspersed between spreading periods."

Irrigation Studies - F. B. Hamilton, Lincoln, Nebraska.-"Studies for the evaluation of irrigated pastures for dairy cattle have been carried on at the North Platte Station for the past 2 years. Three pastures totaling approximately 25 acres have been used. The pastures consist of brome grass and alfalfa of varying composition. Records have been kept of the value of milk produced by the cattle on these pastures. That information will be released by the Station. It will show a very substantial income per acre.

"Irrigation has not been closely controlled. However, records are available showing the amount of water pumped for each of the pastures. The losses due to runoff are negligible. In 1950 several measurements were made of conveyance losses to the field. These measurements showed the approximate delivery efficiency to be as follows: North pasture 87 percent; South pasture 90 percent; and East pasture 87 percent. Pumping record for both years have been corrected by these amounts.

"In 1950 soil-moisture samples were taken at the beginning and at the end of the growing season. Part of the samples were taken to depths of 6 feet and the remainder to 15-foot depth. The net change in water content has been entered as a correction to the total water applied in the 1950 record.

"There was a very close agreement between water applied to these fields for the 2 years and the theoretical consumptive use based on on the Blaney-Criddle Method. While these figures are not based on measurements as precise as we would like to get, we feel they give the best available estimate of the water requirement of irrigated pastures under the climatic conditions they represent.

"These amounts may not represent maximum usage for two reasons. It cannot be definitely stated that the plants had adequate moisture at all times. In addition, there may have been some usage from ground water which lies at depths of 20 to 25 feet. The amount used from this depth should be very small if irrigation of the normal root zone was reasonably adequate.

"In spite of these shortcomings, the data will serve as a guide to setting up water requirement studies. It gives considerable support to the method of computing consumptive use from weather data. Pending more precise information, it could be used by Operations in planning pastures under similar conditions.

Nonasline Grass Plot Experiments (Malheur Experiment Station) - F. M. Tileston, Ontario, Oregon.-"There was no significant difference in the average yield between the two corrugation spacings this year, nor was there any in the previous years. The choice of spacings can be made entirely on the basis of irrigation characteristics such as water use and time required.

"Readings from the electrical resistance moisture block readings indicate that very little soil-moisture withdrawal occurs below 28-inch depth.

"On a plot basis 0.15-inch cornigation spacings have significantly higher infiltration rates than 24-inch cornigation spacings.

"The available water-holding capacity of this soil is about 2.24 inches per foot of depth.

"About 45 to 60 percent of the water available to plants was in the soil before each irrigation was started.

"Soil-moisture withdrawal by plants occurred largely in the first foot of soil with very reduced moisture withdrawal in the second foot and reduced even further in the third foot.

"Efficiency of irrigation studies show that the 15-inch corrugated plots had a higher seasonal irrigation efficiency than the 24-inch plots.

"Infiltration rates for the grass plots have increased through the years of growth."

Farm Field Studies - F. M. Tileston, Ontario, Oregon.-"The available water-holding capacity of the soils on the farms studied is about 2.43 inches of depth

"There was still available moisture remaining in the soil before each irrigation was begun.

"An indication of evapo-transpiration rates for the various crops studied was found.

"Soil moisture with drainal by plants occurred largely in the first foot of soil with a reduced withdrawal in the second and third foot."

Consumptive Use - S. J. Mech, Prosser, Washington.-"This year's data, like that for previous crops, shows greatest peak uses and greatest total use on the wet plots. The smallest peaks and the smallest total use were found on the dry plots. The total consumptive use for the 160-day period, April 24 - October 4, was 33.2, 25.3, and 23.6 inches for the wet, medium, and drop plots, respectively. This is based on the moisture removed from the soil regardless of whether it came from irrigation or rain.

Table 1.--Consumptive use rates for 1950 corn grown under three ranges of available soil moisture. Based on soil-moisture use as determined by soil-moisture samples taken 3 days after one irrigation is stopped and 1 day before the next one begins.

Measurement period		Consumptive use in inches per day
Available Soil Moisture 100 percent - 60 percent		
April 27 -	May 31	0.08
	June 16	.14
	June 30	.23
	July 17	.24
	Aug. 3	.28
	Aug. 15	.32
	Aug. 27	.33
	Sept. 10	.27
	Sept. 22	.20
	Oct. 4	.19
	160-day total use = 33.2 inches	
Available Soil Moisture 100 percent - 35 percent		
April 27 -	May 24	.12
	June 15	.04
	July 7	.14
	July 20	.15
	Aug. 21	.24
	Sept. 14	.22
	Oct. 4	.16
	160-day total use = 25.3 inches	
Available Soil Moisture 100 percent - 15 percent		
April 27 -	May 25	.12
	June 16	.06
	July 12	.13
	July 29	.18
	Sept. 3	.22
	Oct. 4	.15
	160-day total use = 23.6 inches	

Soil-Moisture Extraction - S. J. Mech, Prosser, Washington.-"The results showing soil moisture extracted from the different depths are presented in table 2. They show the portion of the total use that the different depths furnish.

"Comparing the percentages for the wet plots with those from the dry ones, (table 2), it becomes evident that there is only a slight difference between these two extremes. This lack of any appreciable difference leads to the contention that the greater consumptive use is not due to greater evaporation from the soil surface, but is due to greater use from all depths. Percentage wise, there is just as much moisture used from the first foot by the dry plots as by the wet ones. Apparently the wet plots just use more moisture from each of the 4 feet of depth. This should add strength to the contention that the higher moisture conditions actually have greater transpiration and that the differences between surface evaporation on the dry and on the wet plots, if any, are too small to show up under our soil-moisture sampling procedures.

"There is a small difference in the percentage of total use coming from the 4-foot depth. The dry plots obtain a slightly greater portion from the fourth foot than do the wet. The difference is consistent but small."

Table 2.—Soil depth from which water was taken. Based on soil-moisture determinations made 3 days after one irrigation was stopped and 1 day before the next irrigation begins. The 3 inches of precipitation occurring between sampling dates, when included in the first foot, produced the "including rain" results."

Depth in feet	Percent of total		
	Wet	Medium	Dry
		Precipitation not included	
0 - 1	30.7	30.7	28.8
1 - 2	35.1	33.3	33.9
2 - 3	22.8	22.9	23.2
3 - 4	11.4	13.1	14.1
		Including 3 inches of rain	
0 - 1	42.2	42.1	41.9
1 - 2	29.2	27.7	27.6
2 - 3	19.1	19.1	18.9
3 - 4	9.5	10.9	11.5

Simplified Soil-Moisture Computation - S. J. Mech, Prosser, Washington.-"The need for the determination of soil moisture is common in irrigation and soils work. The usual procedure for computing soil moisture involves two steps: (1) Subtraction of the net dry weight from the net wet weight, and (2) the dividing of the resulting difference (water) by the dry weight. The quotient is the percent of moisture on the dry weight basis.

"So many of the people I have met are using this two-step procedure that, I am convinced, this practice must be widespread. I hope the following description of our simplified procedure will be of as great a value to others as it has been to us.

"Our current procedure involves only one computation. We omit step No. 1 listed above, and merely divide the net wet weight by the net dry weight and obtain the soil-moisture percentage by disregarding the first digit of our result. When the first digit (usually the figure 1) is disregarded, the balance of the quotient is exactly the same as that obtained by first, subtracting and then dividing. We've substituted the dropping of the digit for the subtraction in the first step.

"Let us consider a sample whose wet weight was 187 grams and dry weight equal to 159. The water content is 187 minus 159, or 28 grams. The weight of the water divided by the dry weight is 28/159 or 17.61 percent. The wet weight of 187 divided by the 159 gram dry weight is equal to 117.61 percent. By simply disregarding the first digit our result can be read 17.61 percent.

Seepage Losses from Irrigation Channels - Carl Rohwer, Ft. Collins, Colorado.-"The rate of drop in the seepage rings at the Horticultural Plot and at the Bellvue Laboratory was measured during October 1950. The rates were measured at various depths. During these tests the water flowing into the rings was shut off. Mr. Robinson has now analyzed these data. He found that the seepage rates plotted against the depths are in a straight line. Very little deviation in the result occurred. Since the data plot in a straight line it was possible to extend the lines to find the seepage rate from the rings at zero depth. Dr. Peterson has pointed out that the seepage rate at zero depth is the permeability constant k if the effect of capillarity is ignored. And, since capillarity is not a factor in the inner ring because of the buffer ring, the seepage at zero depth is the permeability k.

"This fact is of particular significance because it has been necessary in the past to estimate the length of the soil column in computing k from permeameter tests. Since at zero depth the head is always equal to the length of the soil column through which the water is flowing, no direct measurement of the length of the column is necessary. Plans are being made to utilize this information in developing a permeameter for measuring the permeability of undisturbed soils. The value of k determined by this method should make it possible to estimate the seepage from proposed canals."

Border Irrigation - W. D. Criddle, Boise, Idaho.-"The manuscript entitled 'A Method for Evaluating Border Irrigation Layouts,' by Wayne D. Criddle and Sterling Davis has been sent to Mr. Clyde and Washington, D. C., for review and approval. Approximately 1,000 copies of this report have already been requested by the various Western Regional Offices of the Soil Conservation Service."

4/20/51